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CONVENTION NOTICE
King Edward Hotel
June 25, 26, 27, 28, 1928
Ha, Ha! Skinney Wada say
Convention today
Down Toronto way.

MONTHLY REVIEW

Published by the

American Electroplaters Society

Publication and Editorial Office

3040 Diversey Ave., Chicago

VOL. XV MARCH, 1928 No. 3

EDITORIAL

This month finds three-fourths of the fiscal year over and the finals nearing the end, and our ANNUAL MEETING at TORONTO, CANADA, beginning to loom up before us.

Members, it is the duty at this time of each of us to begin to get inspired with this meeting, because it is the place where we must lay the ground work of the next year's progress and find the flaws in the past year's work, promote the good and welfare of our members, and create interest in the non-member that he may be made to realize what a privilege it is to have access to the files of so great an organization as this.

This will be the second time in the history of the society that we have gone outside of the United States to hold our annual meeting, and inasmuch as the minority of our members live in Canada, it bespeaks well for these Canadian members, it proves that they are of the progressive type of men, and some of the best in the industry and should behoove the members and the non-members in the United States to be at this convention, or annual meeting, that nothing be lost to your employer that will surely become a pronounced leader before the year has passed.

W. S. Barrows, the General Secretary of the convention and Past Supreme President and Associate Editor of your REVIEW, at the present time, is one of the most industrious members of the American Electroplaters Society and is entitled to your utmost support, and many times in the past has contributed much to the progress of our society, let's make it retrotractive and contribute largest attended convention the society ever had to Walter's energy and untiring faith in his fellows in the plating field.

The educational program will be the best that has ever been presented to the attendance, and the social part of the program will be amply taken care of. It is needless to mention the many interesting things this fine city has in store for the tourist and visitor to conventions, and we'll guarantee that this will not be too dry to interest you.

Do not wait until May to make up your mind to be there, but get busy now and prepare to come along. Start to tell your EMPLOYER about it, enthuse him, so that when the time comes HE will not haggle with you about the value of this trip, but will be concerned about the loss to himself if you do not attend. Give vent to your executive force and become valuable to the firm that are your employers. If necessary, bring them along to attend the GREATEST ANNUAL meeting and convention this SOCIETY has ever HELD.

NICKEL ANODES 95 = 97% VS. 99%

January 17, 1928

By Cleveland F. Nixon, Western Clock Co., La Salle, Ill.

Introductory

The best, and as far as I know, the only thorough going research on nickel anodes, is that of Thomas and Blum of the Bureau of Standards. Their report was published in the Transactions of the American Electrochemical Society, page 193 of Volume XLV. Detailed therein is a study of the behavior of some twenty types of anodes, including electrolytic nickel, nickel shot, and rolled anodes as well as a goodly number of sand and chill cast specimens in each of three solutions.

The three solutions were (1) the chloride solution containing $NiSO_4.7H_2O$ — 19.0 oz./gal., NH_4Cl 1.8 oz./gal. and H_3BO_3 — oz./gal., (2) the double salt solution which was the same as (1) with $(NH_4)_2SO_4$ instead of NH_4Cl and (3) single salt solution containing the $NiSO_4.7H_2O$ and H_3BO_3 only. The tests were made under special carefully controlled conditions to insure comparable results.

It was found, briefly, that all the anodes corroded with an efficiency of over 95% in the chloride solution, while in the other two the anode efficiency varied greatly with the nature of the

anode. The manner of corrosion was also found to depend upon the anode regardless of the solution. In regard to the foreign elements present, carbon was found to increase corrosion of the anode and to promote, in addition, uniform corrosion, while sulphur was found to be deleterious in that it caused irregular corrosion; copper, iron, tin and silicon were observed to have little effect upon anode behavior. The tentative specifications for cast nickel anodes suggested as a result of these experiments is as follows:

Nickel—not less than.....	95.0 %
Carbon	1.25
Copper—not more than.....	0.25
Sulphur—not more than.....	0.10
Iron, Silicon, Tin—up to.....	1.0 each,

permissible but not recommended.

Immediately after the reading of this paper in Philadelphia doubt was expressed by Mr. Hogaboom and others as to the possibility of applying these conclusions, without some qualification at least, to practical plating problems. The conditions set up to avoid irregular results were, of course, quite different from those which we obtain in a plating room. For example, the anodes to be tested (1" by 4") were given a preliminary run in a chloride bath to remove the surface film, they were rotated during the test to throw off the sludge and to keep the solution thoroughly mixed, while the whole test lasted but 6 or 18 hours, depending upon the anode current density. The objections voiced in the discussion did not come, of course, as news to the authors. In their introduction they say: "Much more comprehensive researches will be required in order to explain and co-ordinate many of the observed phenomena, and more extensive observations in commercial plants will be needed before complete specifications for the manufacture and use of nickel anodes can be successfully defined."

A number of articles since the one discussed above have appeared which, however, deal with the problem in a qualitative manner and which in many cases were written by persons with axes to grind. The tentative specifications are, however, far from being universally accepted. The tendency is apparently toward purer and purer nickel anodes until even the purity of the well known Ivory soap is far surpassed.

Purpose

The purpose of this paper is, in general, to build up a procedure

by means of which anodes and every day plating solution performance may be examined quantitatively and the various data expressed definitely so that they may be compared one with the other, and with the results obtained by laboratory experimenting; and, in particular to compare the performance of two types of anodes—the 95 = 97% sand cast and the 99% sand cast, as revealed by a three months' plating room run. In this connection this paper is more or less a progress report, since a study of but two anodes by no means exhausts the subject.

Procedure

Two test runs were made which were as near identical as plating room procedure permits, except for the change of anodes; both types of anodes were tested in the same solution one after the other. The volume of this solution was 1346 gallons and it was contained in a lead lined moving cathode tank.

At the beginning of each run the anodes were weighed and the solution analyzed for nickel, chloride, boric acid, total sulphate, magnesium, and pH. The current in ampere hours for the period was measured by means of a Sangamo ampere hour meter. During the run analyses for nickel, chloride and pH were made biweekly, as is our custom, for control purposes, and for boric acid and magnesium monthly for the same reason. At the end of the run the solution was again completely analyzed and then pumped to a storage tank. The yellow tank sludge was sampled and the black anode sludge collected for analysis, and the cleaned anodes reweighed. From this data is conjunction with the record of material additions it was possible to calculate with reasonable accuracy anode efficiency, dragout, and cathode efficiency.

Experimental Data—A. Anodes

We will first consider the anodes and follow with a discussion of dragout and of cathode efficiency.

The solution in which both anodes were tested was of the single salt variety, well supplied with chloride. The composition of this solution as calculated from the average complete solution analysis is as follows:

$NiSO_4.7H_2O$	21.0	oz./gal.
$NiCl_2.6H_2O$	2.0	"
NaCl	2.0	"
$MgSO_4.7H_2O$	2.5	"
H_3BO_3	2.0	"
pH	5.7	"

The average anode current density was about 4.5 amperes per square foot while the average cathode current density was between 7 and 10 amperes per square foot. Thomas and Blum, in

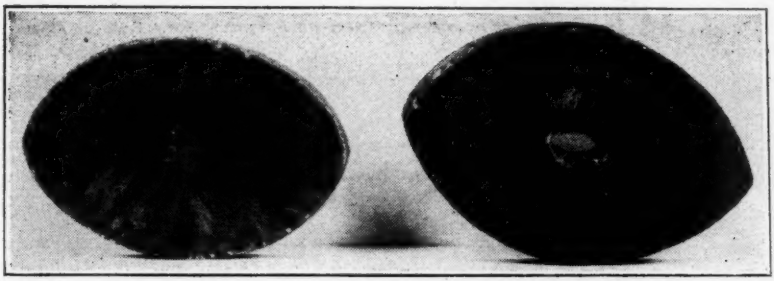


FIGURE 1

Microstructure of the 96.3% nickel anodes at the left and that of the 99% nickel anodes at the right.
Etched as anode in 10% HCL solution.

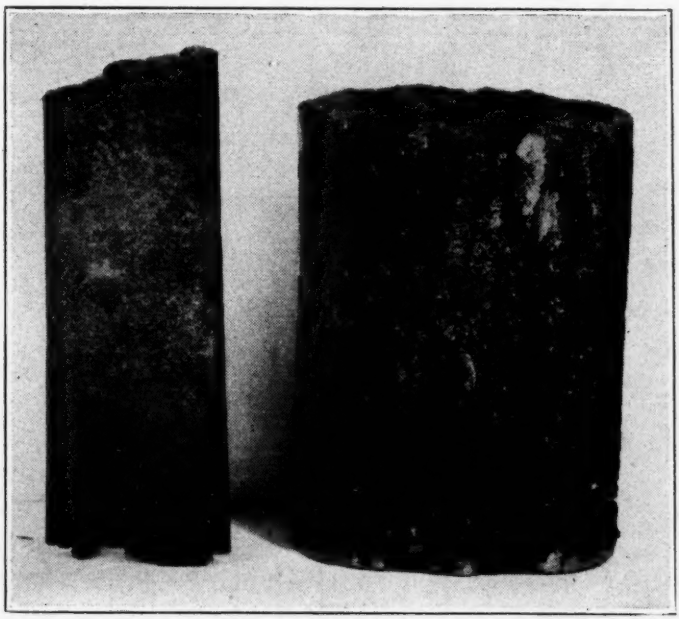
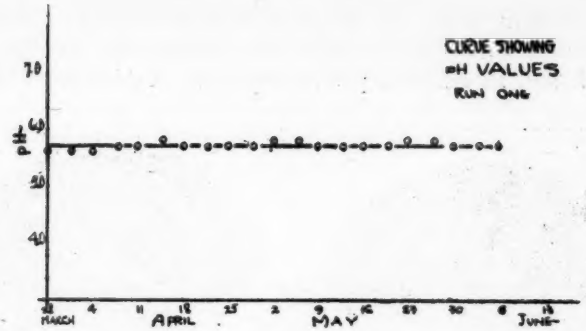
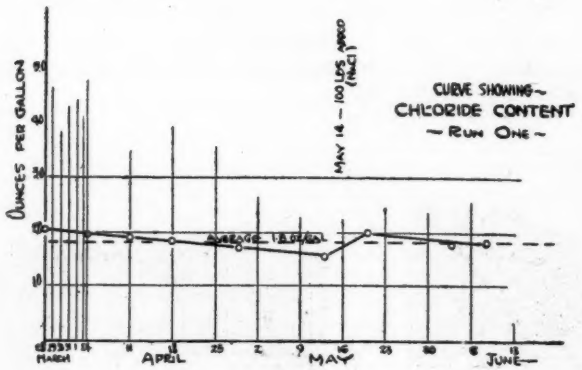


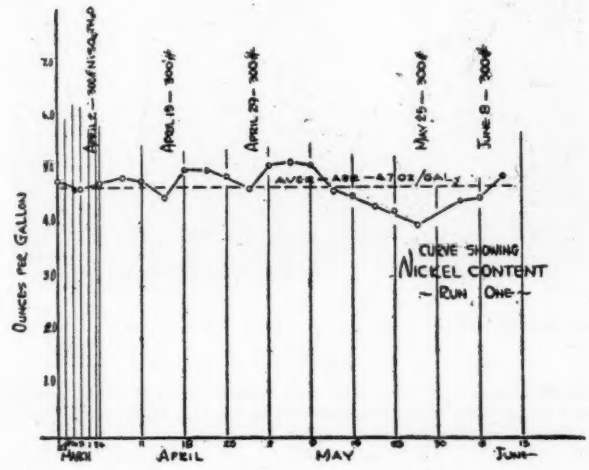
FIGURE 2

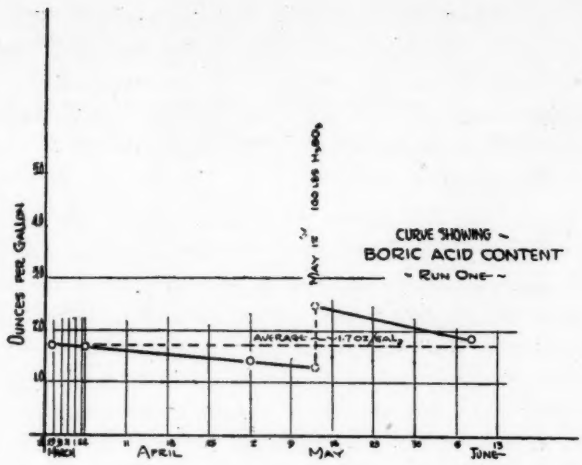
The anode section at the left was taken from a 96.3% nickel anode after more than year's hard usage, while at the right is a typical section of 99% nickel anode after 6 months' service.

their experiments cited above, used two anode densities—4.6 and


CURVE SHOWING
pH VALUES
RUN ONE
pH
7.0
6.0
5.0
4.0
MARCH
APRIL
MAY
JUNE


CURVE SHOWING
CHLORIDE CONTENT
— RUN ONE —
OUNCES PER GALLON
MAY 14 — 100 LBS ADDED (NaCl)
AVERAGE 18 OZ/GAL
MARCH
APRIL
MAY
JUNE


CURVE SHOWING
NICKEL CONTENT
— RUN ONE —
OUNCES PER GALLON
APRIL 2 — 300 #
APRIL 19 — 300 #
APRIL 29 — 300 #
MAY 25 — 300 #
JUNE 8 — 300 #
AVGE. ABS. 4.7 OZ/GAL
MARCH
APRIL
MAY
JUNE



14 amperes per square foot. It is interesting to note that invariably best corrosion was obtained at the lower current density.

The 95-97% and the 99% anodes were oval in cross section and 24 inches long. They were cast in sand and used without subsequent heat treatment. Analyses revealed the following compositions:

TABLE 1

	B. of S. No. 14	95-97% Anodes	B. of S. 4	99% Anodes
Nickel	....	96.30	..	99.00
Carbon	1.5	1.39	.12	.10
Iron	1.45	1.54	.13	.66
Copper	.30	.33	.30	.16
Tin	....	.066	..	.027
Manganese	....	.046	..	.....
Silicon	....	.32	..	.19
Sulphur	....	.....	..	.....

The free carbon in the low purity anode was distributed in the flake form said to be conducive to even corrosion; the flakes may readily be seen under a miscroscope at a magnification, say 500 diameters, makes it possible to discern small fairly regular crystals with well defined grain boundaries, while the microstructure observable (See Figure 1) shows a typical dendritic cast structure. These anodes did indeed dissolve evenly; at the end of the run the rather thick anode sludge was easily scraped off. The microstructure of the high purity anode was rather featureless, there

were no free carbon flakes to look at nor was there any definite crystal structure. The microstructure is much coarser than that of the 96.3% anode, which fact accounts in part at least for the irregular corrosion observed. As you may observe the surface has become so rough as to render the removal of the anode sludge at the end of the run quite difficult.

Were it not for the above mentioned sludge the calculation of anode efficiency would be quite simple; assuming its absence the actual loss in weight divided by the theoretical loss as calculated from the ampere hours consumed and multiplied by 100 would give anode efficiency directly. But since the anode sludge is in the main composed of undissolved anode debris it represents, when scraped off, a loss in anode weight from which no benefit is derived; it is a factor which cannot be neglected. The anode scrapings were therefore collected in barrels, washed, dried and analyzed; the anode scraping data is contained in the following tabulation:

TABLE II—Anode Scraping Data

	96.3% Anodes	99% Anodes
Total weight, washed and dried	42.10#	29.40#
Nickel content	65.40%	79.55%
Iron	3.02%	1.08%
Copper	2.39%	1.09%
Carbon	16.24%	1.03%
Balance	13.00%	17.25%
Combined weight of Ni, Fe, Cu and C (A)	36.6#	2.45#
Anode sludge factor (A) gross loss of anode weight	5.85%	3.33%

The combined weight of nickel, iron, copper, and carbon, in the sludge is considered as anode debris, while the balance, though it undoubtedly contains some of the silicon, tin, manganese and other minor impurities, is considered as oxygen combined with various metals as oxides and so was not part of the anode originally. In order to reduce anode debris to a basis that may be used for comparison purposes, the following anode sludge factor was developed:

$$\frac{\text{Combined weight of nickel, iron, copper, and carbon in anode sludge}}{\text{Gross anode loss in weight}} \times 100 = \text{anode sludge factor.}$$

This factor is calculated for the anodes in question and reported in Table II.

We may now proceed directly with the calculation of anode efficiency. The general formula to be used is:

$$\frac{\text{Gross loss in weight (of anodes)—Anode debris}}{\text{Theoretical loss}} \times 100 = \text{anode efficiency.}$$

TABLE III—Anode Efficiency

	96.3% Anodes	99% Anodes
Original weight of anodes (lbs.)	2,701	6,310
Final weight of anodes (lbs.)	2,075	5,586
Gross loss in weight (lbs.)	626	724
Less anode debris (lbs.)	36.6	24.5
Net loss of weight (lbs.)	589.4	699.5
Total ampere hours	251,166	307,076
Theoretical amount of Ni dissolved—by Faraday's laws (lbs.)	609	743
Anode efficiency	96.7%	94%

The difference between the original weight of the 96.3% anodes and the original weight of the 99 percenters was due to the fact that the former were old, well serviced anodes at the beginning of their test, while in the later case the anodes were new.

Referring, now, back to the article on nickel anodes by Thomas and Blum it may be observed that their No. 4 is a sand cast anode, the analysis of which corresponds fairly well with that of the 99% anodes examined in this paper, and that even more closely does their No. 14 correspond with our 96.3% material. The results they obtained on these anodes correspond fairly well with those obtained in the present study. Both low purity anodes corroded smoothly and with high efficiency. 99% is the Bureau of Standards result as opposed to 96.7%. Both high purity anodes corroded unevenly while the Bureau of Standards obtained again an anode efficiency of 99% against our 94% efficiency. Although the present results do not have the precision of laboratory experiments, they at least have the merit of being based upon actual performance over a considerable period of time, so that the effect of minor errors is minimized.

It is now fairly plain that neither of the anodes tested may be termed satisfactory though neither has any noticeably harmful effect upon the deposit we require—which must be of good color, free from pin holes and all blemishes and .0001" thick—and while anode efficiency is quite good—the anode sludge and the tank sludge formed is not desired and in the case of 99% anode the irregular corrosion is quite objectionable, reading as it will to high scrap loss, at the end of their period of usefulness.

Because the yellow tank sludge seemed to be caused largely by

the anodes, although it was not needed is the calculation of anode efficiency, and because it must be considered in connection with dragout it may well be discussed at this juncture. The whole volume of tank sludge could not be washed and dried, obviously. A tank as large as the plating tank itself would be required to do this. And so an aliquot sample was taken, and washed, dried and weighed. The 96.3% anode tank sludge was then analyzed; the 99% sludge was not analyzed. There were 50 pounds of 96.3% sludge and it contained 29.85% of nickel and 8.79% of iron possible combined as basic sulphates and borates and hydroxydes. The 99% anode tank sludge weighed in all but 5 pounds and was assumed to be of the same analysis as the other.

B Dragout

Dragout is a factor which need not affect computations in laboratory work, but in plating room usage dragout is unavoidable and therefore must be considered here to obtain a true picture of tank performance. In keeping with the general scheme of this paper a quantitative rather than a qualitative expression for dragout was sought. It is a rather simple matter to thus determine dragout; it may be calculated from the analysis data of any of the substances in the solution, the concentration of which is independent of the current, and therefore completely dependent upon dragout. There are four such substances: chlorine, the sulphate radical, boric acid and magnesium. Dragout was determined by means of all four substances for both runs, but for simplicity only two of these will be considered and those only in connection with run 1. The determination by means of SO_4 checked nicely with the two reported; the magnesium calculation, however, gave a rather low result.

Following is the general formula employed:

$$\frac{\text{Total original wt. of substance in oz.} + \text{Wt. in oz. added during run.} - \text{Total final wt. in oz.}}{\text{Average oz. per gallon content for period of run}} = \text{Number of gal. lost by dragout.}$$

Remembering that the solution volume was 1346 gallons the total original weight and total final weight of each substance may be calculated from the analysis at the beginning of the run and the analysis at the end of the run:

TABLE IV—Solution Analysis

	Beginning of test run	End of test run
Ni	4.63	4.82
SO_3	5.94	6.96
Cl	2.03	1.53
H_3BO_3	1.74	1.60
$MgSO_4.7H_2O$	2.23	2.47
pH	5.8	5.7

The weight of materials added during run is as follows:

$NiSO4.7H_2O$ ..... 1500 pounds
$MgSO4.7H_2O$ ..... 100 pounds
H_3BO_3 ..... 100 pounds
NaCl ..... 100 pounds

The average ounce per gallon content is taken from curves 1 and 2, showing the fluctuations in chlorine and boric acid contents respectively.

Now substituting in the formula

$$(1)\ \text{Chlorine:}\ \frac{2735 + 972 - 2060}{1.80} = 915$$

$$(2)\ \text{Boric Acid}\ \frac{2340 + 1600 - 2170}{1.70} = 1040$$

The average of these two values is 980 gallons which is a fairly accurate value for dragout.

Before leaving the subject of dragout it may be well to set up a scale of values so that future determinations may have some comparative value. Such a scale should not be dependent upon volume of solution alone, but rather it should indicate the ratio between solution dragged out and tank capacity over some given period of time. It is therefore suggested that the dragout number be considered the volume dragged out in one year over tank capacity.

For the present tank then the dragout value is:

$$\frac{980 \times 2300\ \text{(approx. number of working hours in 1 year)}}{504\ \text{(working hours of test)}\ 1346\ \text{(tank capacity)}} = X.$$

$$X = 3.2\ \text{Dragout number.}$$

It is now apparent that the nickel sulphate added was not needed to replace a loss due to poor anode corrosion. The magnitude of the dragout loss came rather as a surprise, for though it was known to be high, it was not known that over three tanks full of perfectly good solution went down the sewer every year. A method whereby

this loss may be lessened without interfering with production would be greatly appreciated.

With the existence of such a dragout loss verified it becomes apparent that there is a nickel content higher than which it is not economical to maintain. The deposition advantages of high nickel content are soon overbalanced, as nickel content increases, by high dragout loss. In general, it seems clear, the nickel concentration should be as low as is consistent with the results desired.

C Cathode Efficiency

H. E. Haring points out in an article entitled "Throwing power, etc., is Nickel Deposition" A. E. S. XLXI (1924), page 107, that points out that there is a close relationship between high cathode efficiency and good throwing power. To quote, "Further improvement in the throwing power of the present type of nickel solution is to be sought in improved cathode efficiency particularly at low current densities." It is known that the throwing power of the solution studied was good; it will be interesting to see what the cathode efficiency was. The cathode efficiency equals the actual weight of nickel deposited times 100 divided by the theoretical weight of nickel deposited. The theoretical weight of nickel deposited is the same as the theoretical weight dissolved or 609 pounds. The actual weight deposited must be obtained indirectly; to weigh the 750,000 parts plated before and after plating was out of the question. The indirect method used may best be shown by means of a nickel balance sheet.

TABLE V—Nickel Balance Sheet

Nickel Into Solution	Lbs.	Nickel Out of Solution	Lbs.
Nickel in solution at beginning of test	390	Ni remaining in solution at the end of the test	405
Nickel added during run	312	Ni lost by dragout (av. Ni content/gal. 4.7 oz. dragout 980 gal.	288
From anodes	589	Ni (and Fe) precipitated in yellow tank sludge	19
		Nickel plated out	579
	1,291		1,291

The cathode efficiency is, then $\frac{579 \times 100}{609} = 95.0.$

The dragout value obtained for the run using 99% anodes was even higher than for Run One, 4.6, which the cathode efficiency was somewhat lower—91%.

Summary

Two common anodes, one of the 95-97% and one of the 99% class have been examined and, although their corrosion efficiencies are fairly high—96.7% and 94%, respectively—neither may be considered entirely satisfactory. The use of the 95-97% anode leads to the formation of an objectionable amount of anode and tank sludge, while the 99% anode not only becomes coated with some sludge but corrodes so very unevenly that its usefulness is thus impaired. Neither anode, then, may be accepted as satisfactory; the search must proceed further.

Dragout has been determined quantitatively and found to be surprisingly high. The losses due to dragout may easily lead to false conclusions in regard to anode corrosion or cathode deposition; it would be a very desirable thing to eliminate dragout but how to do it without interfering with production is the thing.

Cathode efficiency was found to be 95% when the 95-95% anodes were used and 91% for the 99% anode. This difference may or may not have significance, in this case as in the others, more such observations will be needed before many definite conclusions may be drawn.

Discussion on Mr. Nixon's Paper

Mr. Proctor: I think that when they use 99% heat treated anodes and if the anode is annealed for an entire week they will then find entirely different results. Several years ago we were making what was called the "Cross Built Bumper." We nickel plated first on the straight steel, and the bumper parts were heat treated. We had to get a pure anode with a high corrosion. They should heat treat those anodes for an entire week, which we did, and as I remember it those anodes reduced so that there was practically no sludge from the anode excepting a slight nickel oxide. This can be done if the anode is treated for a sufficient length of time.

Mr. Norgan: At what temperature had the anodes to be heat treated and for how long a time?

Proctor: I believe they were treated at about 1600 or more Fahrenheit. They were packed in charcoal during that period.

Mr. Servis: Did you make any analysis of deposits of the 95-97 and 99% and note the difference in the deposits tested for corrosive tendencies of the two deposits?

Mr. Nixon: No, we did not.

Mr. Hay: At what temperature are they annealed or how often are they annealed?

Mr. Nixon: I don't know much about the annealing of the anodes. Perhaps Mr. Proctor knows more about that.

Mr. Proctor: If we accept the Bureau of Standards conclusions, the

corrosion of the anodes will be uniformly high regardless of the nature of the anode so long as there is plenty of chloride, but when the chloride is left out then the nature of the anode has a very remarkable affect upon the efficiency.

Mr. Allen: What was the nature of the deposit in this different analysis as to metal used, that is, what was the relationship of the metal deposits to the pitting?

Mr. Nixon: As I said before, the only tests we used for the deposit was: first, for good color, easy buffing, no pits or blemishes of any kind, and thirdly, it must be a thickness of at least 1/10,000 of an inch. For both anodes these requirements were made.

Mr. Tomkins: What affect has the shape of the piece on the dragout as to the area of each piece?

Mr. Nixon: On these pieces plated there was no cupping, they were gongs in the shape of a shallow cup, so hung on the racks that the solution ran out of it. I presume the dragout was very direct with the surface of the work plated. The more surface there was the more solution there would be hanging to it.

Mr. Allen: In regard to the difference of the higher purity anode in regard to the pitting?

Mr. Servis: The subject in particular was the corrosive qualities of the anode and the efficiency of the anode, which really didn't have much bearing on the deposit; that, of course, would come into a different category. Can you give us any enlightenment on that, Mr. Nixon?

Mr. Nixon: The work had to be absolutely free from any pits.

Anonymous: Was there any difference between the low percentage anode and the high percentage anode?

Nixon: No difference at all.

Anonymous: At what temperature was the solution held?

Mr. Nixon: 70 degrees Fahrenheit.

Mr. Hazucha: There is a question as to the difference in the metallic content or the upkeep of the metallic content in the solution that contained 99% and 96% anodes. Was there any difference in maintaining the metallic content in those two solutions? Did it require more salts in any one of the solutions? In other words, is the corrosion on the anodes on both solutions the same?

Mr. Nixon: On the 99% the anode was 96.7 and the cathode 95. Therefore we have 1.7 which must have been taken up in the solution. In the 96% the anode was 94 and the cathode 91, so the solution must have furnished the other 3%. However, the additions made cannot be used in considering whether or not the anodes were efficient, since the dragout overshadows these small differences so completely that they aren't worth considering.

Mr. Hazucka: What was the result on the P. H. concentration?

Mr. Nixon: The curve is the PH for the first run. It was absolutely uniform with no additions made to control. The same holds true for the 99% anode.

CHROMIUM JINGLES

By Hedley Richards, St. Louis Branch

Oh listen you platers and you shall hear
All Chromium plating problems made clear,
Just exactly how it is done,
What you must do and what you must shun,
Take my advice and sidestep all woe,
For I'll tell you all that there is to know.
Lots of Chrome formulas come to your sight,
Choose any one, for they're all of them right,
They all have been successfully tried,
The main thing is Chromium Trioxide.
Use Chromic Acid and water, sufficient
Of both and each to make it efficient.
Add some Chrome Sulphate, so much and no more,
Or a wee drop of H_2SO_4.
It ain't your Chromium education,
The trick is in the manipulation,
Keep the solution at 115 in the shade
Or just about 45 centigrade.
This Chromium stuff has awful bad breath,
So ventilate good or you'll sure choke to death.
Use 200 amps. for each square foot of cathodes
And use steel, iron or lead for the anodes.
One thing about Chrome plating won't make you sigh
Just wipe off the work and put it in dry,
Use conductors and racks that are heavy and strong,
Have everything right and have nothing wrong.
Observe these instructions and all will go well,
For you sure must admit they're as simple as ———.

REPORT ON CONFERENCE ON ELECTROPLATING

Held at the Bureau of Standards, Friday, March 2, 1928

This conference, which was attended by over 75 electroplaters and chemists, was held for the purpose of discussing the research work of the Bureau in this field and of making recommendations for future work, especially by the Research Associates of the American Electroplaters' Society.

In his opening remarks, Dr. George K. Burgess, Director of the Bureau of Standards, referred to the advantages of the Research Associate plan, and commended the Electroplaters' Society and manufacturers for their support of such work.

Dr. William Blum, chief of the electrochemistry section, presided at the morning session and discussed the purpose and scope of the research at the Bureau on electrodeposition. He then reviewed briefly the principal conclusions of the published researches on throwing power and polarization; nickel, zinc and chromium plating; and nickel electrotyping solutions and graphite. Each of these subjects was discussed briefly by the conference.

The reports on researches now in progress may be summarized as follows:

(a) *"Spotting-out"*—W. P. Barrows (Research Associate of the American Electroplaters' Society). Two distinct types of spotting of plated finishes were observed, viz.: "crystal spots" and "stain spots." The former occur only on sulphide finishes that have been lacquered. It has been shown that these crystal spots consist of cuprous sulphide, Cu_2S (which is identical in composition and structure with the mineral "chalcocite"), and that their formation is caused or accelerated by the presence of sulphur or sulphur compounds including minute amounts that may be present in wrapping papers. Their formation may be retarded or prevented by the use of wax paper, or the application of a very thin film of grease. These methods are now being tried on a semi-commercial scale by several manufacturers, and full reports will be made later.

The stain spotting, sometimes referred to as "creeping out," frequently observed on cast metals, is now being investigated. No results have been obtained, except a preliminary confirmation of the general view that this type is associated with porosity in the base metal.

(b) *Composition and Analysis of Cyanides*—M. R. Thompson

—In order to obtain material of high purity to serve as a reference standard, some very pure potassium cyanide has been prepared from pure hydrocyanic acid. It is hoped to prepare sodium cyanide of equal purity. Results so far obtained indicate that for pure alkali cyanide the regular Liebig silver nitrate titration yields accurate results.

(c) *Overvoltage*—H. E. Haring—The nature and importance of overvoltage were discussed and the plans for its study were explained. Owing to the recent resignation of Mr. Haring, this investigation must be postponed; but will be undertaken at the first favorable opportunity.

(d) *Iron Deposition*—C. T. Thomas—Some specimens of electrolytic iron, 0.25 inch thick, were shown. These were deposited in connection with some promising experiments at the Bureau of Engraving and Printing upon the reproduction of engraved plates by deposition of iron, instead of copper and nickel as used at present. The iron plates, if adopted, will be chromium plated.

(e) *Addition Agents in Copper Electrotyping Solutions*—R. O. Hull (Research Associate of the International Association of Electrotypers)—In order to determine the practical utility of addition agents for such baths, experiments are being made upon the maximum rate of deposition, and the properties of the copper deposited from simple baths and those with typical addition agents.

At the afternoon session, at which Mr. R. J. O'Conner, Chairman of the Research Committee of the American Electroplaters' Society, presided, subjects for future research were discussed. The need was emphasized for the further study of chromium plating and especially of the plating conditions and the properties of deposits best adapted for various types of service. Further studies were also suggested upon nickel plating, including pitting, the measurement of pH by various methods, and the relation of the nickel plating to subsequently applied chromium plating.

The visitors inspected the electroplating laboratories, and also those devoted to optical glass, paper, textiles and mechanical testing. On the following day, a large number visited the electrolytic section of the Bureau of Engraving and Printing and saw the production and chromium plating of the plates used for printing currency and stamps.

On March 3, the Officers and Research Committee of the American Electrotypers' Society met at the Bureau of Standards. They

decided that the present Research Associate, Mr. W. P. Barrows, should continue the study of spotting-out. In addition they authorized the employment of another Research Associate to conduct further studies on chromium plating. As soon as a suitable person can be engaged, this work will be initiated.

Register of Electroplating Conference at the Bureau of Standards on March 2, 1928

Name	Firm	Address
Abbotts, Leonard	Bridgeport Metal Goods Co.	Bridgeport, Conn.
Andersen, Bjorn	Celluloid Corporation	Newark, N. J.
Anderson, E. G.	American Hardware Co.	New Britain, Conn.
Barrows, W. P.	Amer. Electroplaters Society.	Washington, D. C.
Baulieu, W. E., Jr.	Bridgeport Brass Co.	Bridgeport, Conn.
Beck, C. F.	Yale & Towne	Stamford, Conn.
Bekkedahl, N.	Bureau of Standards	Washington, D. C.
Blount, E. G.	Indiana Lamp Corporation	Connersville, Ind.
Blum, W.	Bureau of Standards	Washington, D. C.
Boutell, Hugh G.	Bureau of Standards	Washington, D. C.
Brown, J. Rowland	Reliance Gauge Column Co.	Cleveland, Ohio
Burgess, George K.	Bureau of Standards	Washington, D. C.
Burns, R. M.	Bell Telephone Laboratories.	New York City
Clark, Austin B. J.	Bureau of Standards	Washington, D. C.
Conley, Chas. C.	National Cash Register Co.	Dayton, Ohio
Corbit, John	Westinghouse Elect. & Mfg.	E. Pittsburgh, Pa.
Darling, H. R.	Eastman Kodak Co.	Rochester, N. Y.
Davis, A.	Knickerbocker Electrotype Co.	New York City
DeVoti, Wm.	Consolidated Safety Pin Co.	Bloomfield, N. J.
Dimon, Richard A.	Scovill Mfg. Co.	Waterbury, Conn.
Eddy, George E.	Lockwood Mfg. Co.	S. Norwalk, Conn.
Elwin, Tennant	Conn. Telephone & Elec. Co.	Meriden, Conn.
Faint, Edward W.	International Motor Co.	Allentown, Pa.
Fraine, W.	National Cash Register Co.	Dayton, O.
Fraser, O. B. J.	International Nickel Co.	Bayonne, N. J.
Gillett, H. W.	Bureau of Standards	Washington, D. C.
Gottsmann, John A.	John A. Gottsmann & Co.	Washington, D. C.
Haring, H. E.	Victor Talking Machine Co.	Camden, N. J.
Harris, Chas. W.	Universal Plating Co.	Washington, D. C.
Heallis, E. J.	U. S. Naval Gun Factory	Washington, D. C.
Hedden, S. E.	Enameled Metals Co.	Etna, Penna.
Herzog, G. K.	Union Carbide & Carbon Res. Labs.	New York City
Hicks, R. E.	Yale & Towne	Stamford, Conn.
Hirsch, Albert	Carey, McFall Co.	Philadelphia, Pa.
Hogaboom, G. B.	Hanson-Van Winkle Munning.	Matawan, N. J.
Hoke, C. M.	Hoke, Incorporated	New York City
Hough, F. Z.	U. S. Naval Gun Factory	Washington, D. C.

Howells, L. T.	Cowles Detergent Co.	Cleveland, O.
Hull, R. O.	Intern'l Assn. of Electrotypers.	Washington, D. C.
Job, Robert	Milton Hersey Co., Ltd.	Montreal, Can.
Jones, C. E.	General Electric Co.	Schenectady, N. Y.
Johnquest, H. M.	Chemist	Waterbury, Conn.
Johnson, R. E.	Scovill Mfg. Co.	Waterbury, Conn.
Lawrence, Geo. J.	The J. B. Ford Co.	Wyandotte, Mich.
Lawson, W. W.	Harshaw, Fuller & Goodwin	Philadelphia, Pa.
Luess, Geo. A.	U. S. Naval Gun Factory	Washington, D. C.
Mesle, F. C.	Oneida Community	Oneida, N. Y.
Meyer, Garson	Eastman Kodak Co.	Rochester, N. Y.
Moore, H. R.	Bureau of Standards	Washington, D. C.
Moore, J. F.	Frankford Arsenal	Philadelphia, Pa.
Moul, H. C.	Hanover Wire Cloth Co.	Hanover, Pa.
Mullen, John, Jr.	Superior Metal Co.	Bethlehem, Pa.
McComas, Clarence B.	Carr-Lowrey Glass Co.	Baltimore, Md.
McCrumb, F. R.	LaMotte Chem. Prod. Co.	Baltimore, Md.
McElroy, Charles J.	Bridgep't Metal Gds. Mfg. Co.	Bridgeport, Conn.
McGar, B. H.	Chase Co., Inc.	Waterbury, Conn.
O'Connor, R. J.	Contract Plating Co.	Bridgeport, Conn.
Oswald, F. G.	General Electric Co.	Pittsfield, Mass.
Parker, H. C.	Leeds and Northrup Co.	Philadelphia, Pa.
Perry, J. S.	Eastman Kodak Co.	Rochester, N. Y.
Peter, Herman	Lustro Coated Sheet Co.	Pittsburgh, Pa.
Phillips, W. M.	General Motors Corp.	Detroit, Mich.
Pierdon, F. F.	Art Metal Finishing Co.	Washington, D. C.
Pitschner, K.	American Chain Co.	Bridgeport, Conn.
Proctor, Charles H.	Roessler & Hasslacher Chem.	Arlington, N. J.
Renfro, George E.	Bureau of Standards	Washington, D. C.
Robson, A. M.	Reynolds-Robson Supply Co.	Philadelphia, Pa.
Scherrer, W. P.	U. S. Naval Gun Factory	Washington, D. C.
Schwartz, Andrew	U. S. Naval Gun Factory	Washington, D. C.
Scobb, W. M.	Frankford Arsenal	Philadelphia, Pa.
Servis, O. E.	Felt & Tarrant Co.	Chicago, Ill.
Shea, Dennis C.	Standard Oil	Elizabeth, N. J.
Sievering, Philip	Philip Sievering, Inc.	New York City
Sizelove, O. J.	Aug. Goertz Co.	Newark, N. J.
Slattery, Thos. F.	Bureau of Engr. & Printing	Washington, D. C.
Smith, Horace H.	Tiffany & Co.	Newark, N. J.
Sohn, Erwin	Standard Sanitary Mfg. Co.	Pittsburgh, Pa.
Suhl, R. L.	International Nickel Co.	New York City
Taylor, Floyd T.	Hanson-Van Winkle-Munning	Matawan, N. J.
Taylor, W. A.	LaMotte Chemical Prod. Co.	Baltimore, Md.
Thomas, C. T.	Bureau of Engr. & Printing	Washington, D. C.
Thompson, M. R.	Bureau of Standards	Washington, D. C.
Tschantre, H.	Universal Plating Co.	Washington, D. C.
Van Derau, C.	Westinghouse Electric Co.	Mansfield, Ohio
Wagaman, James W.	Mitchell Binder Co.	Hagerstown, Md.
Wagaman, S. M.	W. F. Prior Co., Inc.	Hagerstown, Md.

Washburn, E. W.	Bureau of Standards	Washington, D. C.
Wehmhoff, B. L.	Government Prtg. Office	Washington, D. C.
Welsh, W. E.	Knickerbocker Electrotype Co.	New York City
Westbrook, L. R.	Grasselli Chemical Co.	Cleveland, O.
Williams, Fred H.	Canadian Natl. Railways	Montreal, P. Q.
Willmore, H. G.	Crown Rheostat & Supply Co.	Chicago, Ill.
Zadowoski, N. E.	Peck, Stow & Wilcox Co.	Cleveland, O.

March 10, 1928 W. BLUM.

By Hedley Richards, St. Louis Branch

The Feb. Review has come to hand,
All slick and smooth and snug,
But on page 6 I find the name
Of E. G. Lovernug.

We have a friend in fair Detroit,
Whose praises we all sing,
And he rejoices in the name
Of E. G. Lovering.

I like Frank Hanlon very much,
I love his handsome mug,
He surely knows that Lovering
Is not spelled Lovernug.

It's well for him that Lovering
Is not a low-browed pug,
Or Frank might not live to see the day
He printed Lovernug.

His gore would probably be spilled
All over his best rug,
For taking ring from Lovering
And substituting nug.

If Hanlon don't apologize
His grave had best be dug,
We just can't stand for Lovering
To be called Lovernug.

DAYTON BRANCH

Had a very interesting meeting and a good attendance. Chrome seemed to be the topic for the evening, and the question arose, Why does chrome peel when deposited over nickel? The answers were: P. H. of nickel should be 6.1, absolute cleanliness of the objects.

The question came up as to Mr. Hogaboom's letter of inquiry. Whether to run advertisements in the Review to help pay expenses of the publication? This was discussed at length and a ballot vote taken. The results were NO, not to carry ads.

The question as to carrying questions and answers was brought up and a ballot vote showed YES. This would be more interesting. Educational, also create more interest, and increase membership.

About the other question as how can we improve the Review? This was left for the publication committee, as that was more for them to answer that question than to be left for branch societies.

About this time Van Derau came in, somewhat late, but we all know Van as that goes without saying. At any rate, he always stays till the last, so good for Van, as we are always glad to see him. He always has something good and spicy and has a way to put it over. He gave a very good talk on chrome and had some samples of Britania metal plated with chrome. The talk was very instructive as he told of some of the tricky and bad features of current distribution, as this seems to be one of the main factors in chrome plating.

Meeting adjourned at 10:30.

R. G. Suman.

NEW YORK BRANCH

New York Branch held two meetings in World Building, February 10 and 24, which were very largely attended. Now the members who did not come to these meetings kindly come out and make this your regular stopping place on second and fourth Fridays of each month. Surely if you were elected to office and you did not see very many attending you would say to yourself: Well, I guess all the members know all about the plating trade. Now if you consider you do it gives you a place to come to instruct your brother members till they know something too. You took this pledge while being initiated to membership, so come again to your meetings and help us advance. During each meeting different problems are presented so as to make meetings interesting for everyone present. Our banquet was attended by 575 guests and as far as we know at present was a successful one. The first meeting of March was attended by a large delegation from Newark Branch. There were some of them requested to make a few remarks by President MacStokers. Refreshments were served after meeting was adjourned. Past Supreme President Mesle and a brother member of his branch were also present. Well, members of New York Branch, what do you say about coming to your meetings? You are always missing something. Yours sincerely,

Thomas A. Gardner,
Recording Secretary, New York Branch, A. E. S.

DETROIT BRANCH

The Detroit Branch held its regular monthly meeting February 8, at the Detroit Testing Laboratory.

The request of John A. Hanley for a transfer to the Newark Branch has been approved by the Detroit Branch.

A heated discussion took place on Mr. Hogaboom's letter regarding advertisements in the Monthly Review.

The secretary was authorized to draw $50.00 from the branch funds as per request from the A. E. S. research committee. After the regular business procedure, Mr. B. F. Lewis read a paper on "The Chromium Patent Situation," which was enjoyed by the members, and a rising vote of thanks was given him. This, of course, brought on a discussion on Chrome plating.

The educational committee will have another surprise in store for us at our next meeting, which no doubt will be a dinner-meeting and will be held at the Engineering Society clubrooms.

Chas. Mascola, Secy.

NEWARK BRANCH

ANNOUNCEMENT

Owing to circumstances over which we have no control, the Tenth Annual Banquet and Educational Meeting of the Newark Branch of the American Electro-Platers' Society will be held on Saturday, April 14th, at the Elks Club, 1048 Broad Street, Newark, instead of Achtel-Stetters as previously announced.

The meeting will start at 3:00 o'clock sharp, and the following speakers will take part:

"Address of Welcome," Chas. H. Bohler, President, Newark Branch; "Chromium Plating, Past, Present and Future," Chas. H. Proctor, Research Engineer, Roessler and Hasslacher Chemical Co.; "Chromium Experiments," Oliver J. Sizelove, Instructor of Electroplating, Vocational School, Newark, N. J.; "Cathode Potential," Dr. A. Kenneth Graham, Chemical Engineer, Hanson Van Winkle-Munning Co.; "Some Aspects of Chromium Plating," Dr. Hiram A. Lukens, Professor of Electro Chemistry, University of Pennsylvania; "Silver Solutions," G. Byron Hogaboom, Jr., Columbia University, New York City; "The Practical Side of Nickel Plating Aluminum," Harold Work, Research Fellow, Aluminum Co. of America.

THE COMMITTEE.

NEWARK BRANCH

Our business meeting was held on Feb. 17th with 26 members present, Chas. Bohler presiding. Mr. John A. Hanley was accepted by transfer from Detroit Branch, as an associate member.

Mr. John D. Holland was elected to associate membership and 2 applications were received and ordered to take the usual course. Banquet Committee reports still more progress and announces that at our 10th annual banquet, Saturday, April 14, 1928, a 1928 model 4-door "Ford" sedan, fully equipped, will be given away free. An excellent afternoon educational session has been prepared and 6 excellent speakers have been secured.

During our discussions the following question was asked: Why don't a chromium solution plate? Mr. Hogaboom answered the question, giving an excellent talk on the subject. He also spoke on the future of the electroplater and made a prediction which was a surprise to those present. Bright acid dips were discussed and Mr. Hogaboom gave directions for the maintaining of Bright dips for nickel silver which will not mar the polished surface prior to silver plating; also for dipping brass articles when the dips are being used continuously the entire day.

ROYAL F. CLARK, Sec'y-Treas.

March 2nd meeting was presided over by Vice President George J. Wagner. Fifteen members were present. Five of our "regulars" were missing, due to their presence at the Electroplating Conference at the Bureau of Standards at Washington.

Newark Branch members received an invitation from New York Branch to visit them at their March 9th meeting. Several signified their intention of attending and will attend in a body.

Bright silver solutions was the topic for discussion.

Other topics discussed were: How to dry cadmium plated articles without staining. Dip silvering articles after bright silver plating.

Mr. Geo. Onksen gave a talk on his visit through a modern electrotyping plant.

Adjourned 10:30 p. m.

ROYAL F. CLARK, Sec'y-Treas.

TORONTO BRANCH

The monthly meeting of the Toronto Branch was held in the Canadian Foresters' Hall on Monday, February 27th. The business of the evening was very brief. The application of Mr. Harold William Graham was received and handed to the investigating committee. The rest of the evening was taken up by the annual euchre social and a very fine time everybody had. The euchre committee, headed by Mr. Magill, had got together a very fine lot of prizes, which caused competition in the card game to be very keen. After the game everybody sat down to a splendid supper and the conversation naturally turned to the coming convention for which everybody is pulling. During the evening Mrs. Walter Barrows was elected chairman of the ladies' committee,

which was a very good piece of business, so now all visiting ladies will be sure of a splendid reception and a real good time.

With all good wishes, I remain, yours truly,

J. ELLIS, Secretary-treasurer.

TORONTO BRANCH

Convention Forecasts

We will welcome suggestions from the ladies with reference to forms of entertainment most desirable. We do not wish to plan a Bridge Party if the ladies prefer a theater party, or a trip through a Canadian candy factory, if a ladies' soft ball game would prove more satisfying. We can supply anything from a dog fight to a garden party, so send in your good wishes now. We need 'em.

Platers are requested to make an unusually good display of their finished product, accompanied by the required memo of how you did it. Let's have a real honest-to-goodness contest for that first prize award.

Here is a good formula for a sore finger: Slash it on a thin-edged copper anode, swell it in cyanide copper bath, and allow to dry without rinsing. Did you ever try it?

The latest addition to the list of papers is one from W. E. Hughes, England, author of "Modern Electro-plating," and honorary member of the Supreme Society. Now we want papers from other honorable, if not honorary, members. Send us your name and title of paper now, don't wait for a personal invitation, we are busy, pick up your end of the load. "Atta boy." Toronto's population is sufficiently cosmopolitan to suit a variety of tastes. We have Scotch, Irish, Canadian, "Black and White," Cocktails, Ringtails, Retail and Pigtail. So be there without fail.

S'more next month.

W. S. BARROWS, Secretary, Convention Committee.

CLEVELAND BRANCH

Our regular monthly meeting was opened at 8:15 by President McCormick. We had a fair attendance but we had a very good talk on cleaning and cleaners, led by Mr. Thompson, who had tried a dozen cleaners and gave us the cost per piece, also the cost per 100 lbs., besides their good and bad qualities as found in his particular practice, and you would be surprised to hear so many methods of cleaning and so many cleaners, and there is no doubt that every cleaner has its place depending somewhat on the method used, as to what cleaner one must use for best results.

At our next meeting we are going to take up chromium plating again as we have new things to tell as we are getting more experience, so I hope the next meeting will be a crackerjack. So come along, boys, with your chromium news, and I assure you it will be gobbled up as we are still hungry for it.

H. J. TERDOEST, Sec'y-Treas.

PITTSBURGH BRANCH

The meeting of the Pittsburgh Branch, Saturday evening, March 3rd, was turned over to our member, Mr. Harold K. Work, Industrial fellow at Mellon Institute of Research, Pittsburgh, Pa. His subject was Electro-deposition of metals upon aluminum concerning which question Mr. Work's fellowship and research work deals.

The various dips necessary before plating were given, with the point stressed that the copper and silicon contents in the aluminum must be established. Specimens of all kinds were exhibited by Mr. Work. The usual discussion and questions followed, whereupon thanks and appreciations were extended to our fellow member for his usual interesting and instructive lecture.

JOHN E. LOHSTOETER, Acting Sec'y.

CHICAGO BRANCH

Regular monthly meeting Chicago Branch held March 10th at the Atlantic Hotel.

Meeting called to order at 8:15, President Meyers in the chair, with a fair attendance.

The Convention Booster Committee report was received and the members of Chicago Branch are looking forward to the time when they (call all aboard for Toronto) as the committee is trying to arrange a delightful trip for all who can attend the convention.

The regular routine of business being completed, the gavel was taken by the librarian, who found the following questions in the question box:

Question No. 1—What is the best solution and method of oxidizing copper plate?

Answer No. 1—Polysulphide or potassium sulpherette.

Question No. 2—Give formula for nickel strip on steel with current also a strip without current?

Answer No. 2—Sulphuric acid diluted until it stands 55 Baume, add 2 oz. glycerine using lead anodes and reverse current, to use as a dip equal parts of sulphuric acid and nitric acid with salt peter added or sulphuric acid and salt peter.

Question No. 3—Is powdered soap bark a better lubricant for ball burnishing Cadium than soap chips?

Answer No. 3—Soap bark was agreed to be best.

Question No. 4—What is the best method of silver plating nickel plated brass?

Strike first in silver strike then plate in regular silver solution.

Question No. 5—What is the best method of oxidizing silver plated finishes; prefer Platnick finishes?

Answer No. 5—Platinum chloride dissolved in muriatic acid and iron chloride or use hot solution of potassium sulpherette.

Question No. 6—How can copper be removed from silver nitrate solution?

Answer No. 6—Copper washes out as copper nitrate.

Question No. 7—Will cadium added to a nickel solution as a brightener cause a brittleness of deposit?

Answer No. 7—Will cause brittleness to a certain extent if solution is allowed to run to alkaline side.

Question No. 8—If chromium exists in two states, an active and a passive one, what is the best stabilizer?

Answer No. 8—Question held open for further information.

Mr. O. E. Servis made a report on the research meeting held at Washington which was very interesting; also read an article on lacquer which was equally as interesting.

There being no further business meeting adjourned at 10:30 P. M.

S. J. C. TRAPP, Sec'y.

PHILADELPHIA BRANCH

Philadelphia branch held its regular monthly meeting Friday, March 2nd, with an attendance of 53, with President Geo. Gehling presiding.

Four applications were elected to active membership. Two applications were received.

The president called attention to to the Toronto convention and urged the members to write a paper to be read at the convention. He appointed a committee to prepare such a paper.

We had the pleasure of having with us Mr. Chas. Proctor and Mr. Wm. Snyder, who stopped over from the Bureau of Standards meeting. Mr. Proctor spoke on the subject of zinc and cadmium plating, showing various samples and finishes. He also answered various questions. It is always a pleasure to hear Mr. Proctor speak because he always presents his subject so ably. Mr. Snyder, who was pinch hitting for Mr. Proctor in case they were detained at Washington, also made a few remarks which were appreciated.

PHILIP UHL, Sec'y.

WATERBURY BRANCH

Past President Wm. J. Gray presided over the last meeting of Waterbury branch, which was largely attended. The drawing card for the occasion was our old friend William Schneider (Cyanide Bill), who delivered an interesting talk on the subject of Cadmium Plating. The speaker went back a century or so, to the discovery of cadmium, and told of its gradual development into one of the most popular finishes of the day. "Bill" also remarked on the physical and chemical properties of the metal, and passed around some samples which showed

why cadmium was in such big demand. A few remarks were also made on the subject of chromium plating after which numerous questions were asked and satisfactorily answered. This was Mr. Schneider's first appearance before the local branch as a speaker, and it was greatly enjoyed and appreciated. W. F. GUILFOILE.

BRIDGEPORT BRANCH

Meeting opened at 8:15 with the roll call of officers—2 officers were absent. The minutes of last meeting were read and accepted. Communications were read. Mr. Stratton had a bill from the Miller Painting Co. which the secretary was instructed to pay. All members admitted that our rooms looked very good with a new coat of paint. Application of Joe Vugalla was read and handed over to the board of managers for their approval. Mr. Belle had some cadmium solution in his eye but is on the way to recovery.

For the good and welfare, a letter was read from Mr. Belle, telling us how we could improve our meeting, etc. Chromium was discussed, and Mr. Flaherty is going to install a chromium solution and has invited the boys down to see it in action. A special meeting was called for March 9 that we may get our plan for the banquet.

Treasurer's report read and accepted. Meeting closed 10:00 o'clock.

WILLIAM EHRENCRONA, Sec'y.

HARTFORD, CONN., VALLEY BRANCH

A meeting of the Hartford, Conn., Valley Branch, A. E. S., was held on Monday evening, Feb. 27, 1928, at 8 p. m. at the Springfield Chamber of Commerce, on Chestnut St., Springfield, Mass.

The meeting was called to order at 8:30 p. m. by Pres. Elwin. Minutes of the previous meeting were read and accepted. A bill for per capita tax for $21.00, and one for printing for $2.75 were ordered paid. Mr. Apley Austin was elected to our society as an associate member. We also received three applications for publication.

The subject of having a banquet was brought up, and a committee was appointed to handle it.

Pres. Elwin then introduced Mr. Hugh McLeese, Chemical Engineer of the Chromium Corporation of America. He gave us a very good lecture on chromium plating and also answered many questions which arose in regards to chromium plating. In conclusion he was given a rising vote of thanks. He had many specimens on exhibition, some over two years old.

The meeting was attended by thirty members and visitors. The meeting adjourned at 10:15 p. m. VERNON GRANT, Sec'y.

ROCHESTER BRANCH

We held our banquet on March 17, 1928, at the Powers Hotel, and am pleased to hand you herewith the following applications to publish. Hurrah for 1928 Convention.

Arthur E. Thurber, Oneida Community, Ltd., Sherrill, N. Y.
John M. Sears, 12 Grote St., Buffalo, N. Y.
Clifford R. Wheeler, Eclipse Machine Co., Elmira, N. Y.
George B. Onions, 1288 West Ave., Buffalo, N. Y.
Jack W. Snyder, 84 Aurora St., Rochester, N. Y.
Frederick E. Weiss, Hunter Fan & Motor Co., Fulton, N. Y.
George Horsley, 1053 Atlantic Ave., Rochester, N. Y.
Ernest R. Beightol, 245 Shepard Ave., Kenmore, N. Y.
J. William Rushmora, 205 Navarre Rd., Rochester, N. Y.
Mortimer Crumb, Hunter Fan & Motor Co., Fulton, N. Y.

Yours sincerely,

SYLVESTER P. GARTLAND,
Secretary, Rochester Branch.

Do Not Fail to Attend

10th Annual Banquet of Newark Branch April 14, 1928

A 1928 Ford Given Away

Walk in and Ride Out

—COMMITTEE.

SUSPENSIONS

	Branch
H. S. Kneeland, 3925 Clybourne Ave., Cleveland, Ohio	Cleveland
Geo. C. Leach, 52 Victoria St., Revere, Mass.	Boston
S. B. Houlihan, 324 Grove St., Chicopee Falls, Mass	Hartford, Conn., Valley

REINSTATEMENTS

	Branch
Wm. Cummings, 519 Elliott Ave., Springfield, Ill	St. Louis

TRANSFERS

	Branch
John A. Hanley from Detroit to	Newark
Chas. A. Cooper from Philadelphia to	New York

APPLICATIONS

	Branch
Herman Hebestreet, 34 Florence Ave., Irvington, N. J	Newark
Wm. F. Connell, 50 Central Ave., East Newark, N. J	Newark
W. E. Urie, 647 State St., Lancaster, Pa	Philadelphia
E. G. Olliver, Route No. 2, Lansdale, Pa	Philadelphia
Peter Belom, Bristol, Conn	Hartford, Conn., Valley
Albert Westerberg, Springfield, Mass	Hartford, Conn., Valley
Wm. Seidel, Holyoke, Mass	Hartford, Conn., Valley
Joe Vugalla	Bridgeport

ELECTIONS

	Branch
Chas. Karcher, 1916 3rd Ave., New York City, N.Y.	Newark
John D. Holland, 551 Adams Ave., Elizabeth, N. J	Newark
Wm. T. Lewis, 2100 S. 48th Court, Cicero, Ill	Chicago
Jacob Chaplik, 2440 W. Walton St., Chicago, Ill	Chicago
Wm. Dougherty, 1309 Noble St., Philadelphia, Pa	Philadelphia
Jesse N. Eddows, 4901 Stanton Ave., Philadelphia, Pa	Philadelphia
A. Fleming, 2963 N. Fairhill St., Philadelphia, Pa	Philadelphia
Wm. Geirman, care Trenton Brass & Machine Co., Trenton, N. J.	Philadelphia
Elmer PeterJohn, 9414 Elmira Ave., Cleveland, Ohio	Cleveland
Apley Austin, Terryville, Conn	Hartford, Conn., Valley
Harry Simmons, 2270 Walton Ave., New York City	New York
Earle W. Conch, care Apothecaries Hall Co., Waterbury, Conn	Waterbury
Ralph G. Colter, care Y. M. C. A., Waterbury, Conn	Waterbury

BOSTON

Regular meetings are held first Friday of each month, at 8 p. m., at the Boston Platers' Supply Co., 202 Friend St., Boston. Secretary, A. W. Garrett, 488 Quincy St., Dorchester, Mass.

BRIDGEPORT

Meets first and third Friday of each month at 62 Cannon St., Room 17, Bridgeport, Conn. Secretary, Wm. Ehrencrona, 872 Hancock Ave., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., Atlantic Hotel, 816 S. Clark St. Secretary, S. J. C. Trapp, 1127 N. 7th St., Maywood, Ill.

CINCINNATI

Meets every Thursday, 7:30 p. m., at Vocational Training School, Spring and Liberty St. Secretary, Al. Yeager, 2021 Sherman Ave., Norwood, Ohio.

CLEVELAND

Meets first Saturday of each month at Hotel Winton. H. Terdoest, 880 Pioneer Ave., Akron, Ohio.

HARTFORD-CONN. VALLEY

Meets fourth Monday in each month alternately at 266 Pearl St., Hartford, Conn., and corner Broadway and Worthington St., Springfield. Secretary, Grant Vernon, 43 Putnam St., Bristol, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, Robert G. Suman, 66 Notre Dame Ave., Dayton, Ohio.

DETROIT

Meets the first Friday of each month at the Detroit Testing Laboratory, 554 Bagley Ave., Detroit. Secretary, Chas. Mascola, 2041 Beard Ave., Detroit, Mich.

GRAND RAPIDS

Meets on the second Saturday of each month at the Vocational High School, 129 Bostwick Ave., N. E. Secretary, Jacob Van Dyke, 1361 Union Ave., N. E., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at Lipps Hall, 321 3d St. J. N. Hock, 1229 W. 24th St., Milwaukee, Wis.

MONTREAL

Meets last Friday of month at Office of Secretary, John H. Feelay, 411 Aylmer St., Quebec, Canada.

NEWARK

Meets first and third Fridays of each month at Franklin Hall, 41 Franklin St., Newark, N. J., at 8 p. m. Secretary-Treasurer, Royal F. Clark, P. O. Box 201, Newark, N. J.

NEW YORK

Meets every second and fourth Fridays of each month in the World Building, Park Row, New York City, N. Y. Secretary, R. J. Liquori, 127 Vanderbilt Ave., Brooklyn, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 44 Washington St., Prov. Engineers Rooms, Providence, R. I. Secretary, J. H. Andrews, 19 Rosedale St., Providence, R. I.

ROCHESTER

Meets every third Friday of each month at the Powers Hotel. Secretary S. P. Gartland, 128 Bryan St., Rochester, N. Y.

ST. LOUIS

Meets first Friday of each month at Barr Branch Library, corner Jefferso and Lafayette Sts. Secretary, C. T. McGinley, 5312 West Florisant Ave., St Louis, Mo.

TOLEDO

Meets first Thursday of each month at Toledo Secor Hotel, corner Cherry an Page Sts. Secretary, W. W. Weiker, 2228 Middlesex Rd., Route 2, Box 635, Toledo, Ohio.

TORONTO

Meets fourth Monday of each month at Canadian Foresters' Hall, 22 College St., Room No. 2. Secretary, Jos. Ellis, 938 Ossington Ave., Toronto 4, Toronto, Canada.

WATERBURY

Meets every second and fourth Thursday of each month. Secretary, Wm. F. Guilfoile, Garden Theatre Bldg., East Main St., Waterbury, Conn.